Notebook Series -- Notebooks by Edison
Notebook, N-19-01-01.1

This notebook is a continuation of N-18-12-26.2. It was used by Edison during the period January-February 1919 to continue his experiments on processing lithium ores, including lepidolite (lithium mica), amblygonite, and spodumene. The experiments probably relate to Edison's use of lithium oxide in the electrolyte for storage batteries. The entries describe the reagents used to treat the amblygonite or lepidolite and note the presence of a lithium "line" as indicated by a spectroscope. One entry provides an extended description of a "factory process" for spodumene and lepidolite "in case any accident occurs" to Edison, who was about to leave West Orange for his winter home in Fort Myers, Florida. His description includes instructions for processing a ton of ore, as well as a suggestion that the ores should be purchased along with a mine "for reserve." The front cover is labeled "Lithia 2." The pages are unnumbered. Approximately 30 pages have been used.

63 -

10 Ambly floated
5 Magnesium Sulphate
at 1st - only -
On 1130 am - 3rd

Hardly any lime
I now put 10 grams
Lime in
4th 11 am poor line
25 sec with H2O -
abandoned

C13

I will make a Deep with
15 grams — as only 3 grms
here which is extremely
ineffective.

64 -

10 ambly floated
3 Magnesium Hydrox
only at 1st — 3 pm 3rd

No line —

Put on hot plate all night
July 4th 1030 am.
Can see line for 100 sec
(no HCl)
This shows Mg hydrox acts
as a base like Lime but on
account of poor solubility
acts much more slowly
50 sec with HCl & followed —
put back on plate 1030 am 4th
after filtering off & saving 1st
filtrate —
with ~~chlorid~~ (HCl) get slow line
disappearing 30 seconds — This
appears to be working

65

10 ambleq - floated
3 Mg hydrox
2 Sulphate ammon

only get dull line -
Count 33. sec
put some HCl in it
250cc -
~~Y~~ Y leave on all
night. by mistake not
put on hot plate, now on
Jan 4 12 noon
Y to give dull line - Not good
Y guess Abandon

(5)

This is best yet with
10 000 cc get a
considerable better line
than 40 mlg/250 cc
standard –
The residue is considerable
What is the reaction.

Total residue in 10000
cc after Evap
[illegible]
Very small –

66 –

10 grms Ambly floated
10 grms Soda Chloride –
Very strong line
but not so strong
as 69 – as no chloride
counted 200 seconds
& still running –
on all night
Jan 4 12 noon, strong
line, now following

67

10 cubic floated
4 grms Sodium Hyposulfite
250cc after 4 hours
not strong line but
Count 18 before
disappeared —
I leave all night
on plate, 5 pm 3rd
Jan 4 Cant even get a
line — 10 cent worse
Abandoned

68 =

10 ambling floated
1 gram KOH –
10 Lime –

without HCl get rather dull
line 200 seconds but
with HCl – bright line
only 30 seconds
showing rather poorly
250 cc on all night
Jan 4 12 noon 150 ~~[illegible]~~ dull
without HCl 30 seconds
with a bright

Neg – abandon

6000 cc equals 40
this is not as good as
HCl or H_2SO_4 - Later
gave 9000 cc
But $FeCl_2$ was more +
part ferric & decomposed
2nd week filters so
slow that there is 50 cc
not passed thru when
I put water in filtrate
but line is dull —

69 — FeCl seems old & decomposed when dissolved by precip —

10 Ammonium Chloride
10 Ferrous Chloride

Very brilliant - Counted
200 seconds & line still
strong. 250 cc —
line still good at 200
on all night.

Make some good Chloride
+ try def ammonium —
Jan 4 11 am - line just as strong
filtrate Neutral ! !
Saved filtrate & put residue
back on hot plate —
2nd filtrate slimy almost
impossible to filter 250 cc
40 line or better

showing that of time was grown on account of slight solubility of the oxide. The whole comes probably by get out.

This is better than Lime, Barium or Strontium or any of the other Condensation of ~~the~~ alkaline reaction & 100cc work

of course the way I see it much of the oxide must be carbonated,

70.

10 Ambliqonite floated

11 gram Magnesium Oxide –

Water blues Red Litmus right away – on 6pm 5th

930 am Jany 6 – gives good line put back on plate 940 am 6th – with the 750 cc 1st & 2nd filtrate with HCl get 38 seconds line –

4th filtrate, faint line without HCl – now in Fridy & 10 am for 5th French –

Sunday 9th Feby put all together & got 4000 cc but last 18 hours soak filtrate was very strong line

(15)

71-

10 amblygonite floated

20 grammes Magnesium Carbonate

This also blues red litmus paper
but not so quick as Oxide —

Mg

Idea is to get HCl.

72

10 cmcb liquoris floated

10 grains Magnesium Sulphate

10 " " NaCl—

Thus after ½ hour is not slightest acid. + unlike 73

15 hours more neutral

6000 CC—

to make 40 cc's

73 -

10 Ambleg (floated)
10 Ferrous Sulphate
10 NaCl.

This quickly becomes very slightly acid -
After 15 hours slightly acid
after 30 hours very strong
lime 250 cc - Opalescent
fellers good -

Only gives 6500 cc Equal
to 40 mlg standard —

I saved ½ & Evaporated it down — Residue not over 1 grain — S S

Wonderful

soda alum or magnesia or H_2SO_4 good for ambiguous

10 Ambiguous
5 Soda Alum —
shows acid on litmus

after 15 hours I find it is not acid —

gives fairly strong line at End of 400 seconds
no acid — 200 cc

Took ½ of filtrate 1 + 2nd and it required 5000 cc to equal 40 or total 10000 cc
This is as good as 10 alum & shows 5 alum is enough

75

10 grms Arabica floated

10 grms Sulphate Alumina

This brake

as I put reader back
+ forgot it –
I filtered it, of course to
only water left
250 cc better than 40
probably 400 CC
more which would
be 8400 CC

10 milligrams floated
7 = grams Sulphate of
Alumina —
In 20 minutes after
pulling on hot plate.
I filtered a little at
once 200 seconds.
with 250 cc in beaker
then as going down
1st filtrate filters good —
on ~~20~~ 20 hours –

8000 cc Equals
40 mlg – dont think
got all out ~~as~~ time too short

Must now decide between Alum & Sulphate Alumina alone — Costs + time — to determine as well as residue in filtrate —

or H_2SO_4 or MgO or Dolomite

10 ambly floated
2½ grains.
Aluminum Sulphate

after ½ hour on hot plate
250 cc its acid to Litmus
Friday 7 4pm —
Friday 8 10 am slightly acid
good line —
filtering — filters rather
slow but clear —
2nd leach for 3 hours, acid or lime
filters very slow —

About 6500 to 7000 cc
Equals 40 Mlg Standard

78

10-Lepidolite -
10 Soda Alum

for a quick test,

In case any accident occurs to me following process will work on a factory process for Spodumene & Lepidolite -

Break up in Crusher to 1" or less the ore, bring to yellow & then suddenly quench in water - Draw off water - Dry ore & Crush in ball mill etc to very fine powder - Pass this thru pan & Classifier & only take the ore of float that shows under the microscope to be 1000 of inch diameter - The other ore to be dried & regrinded - Grind dry as wear & power tools more than drying if wet crushing is done -

for lep & spod - use about 1 Ton Caustic best grade lime to Ton Ore, Use several iron tanks. Each holding Ton of ore with stirrer which can go as slow as 5 Rev min to keep from Caking on bottom

heavily lag sides top & bottom with Regulation lagging but Extra heavy put Canvas over & heavily paint to keep water of lagging.

Have a set of tanks, after say 3 days withdraw the mix to a filter press, & pass the filtrate to 2nd tank & break up filter Cakes & put back in 1st tank - after ~~3 days~~ put fresh water in 1st tank & after say 3 days filter press 2nd tank - the filtrate going to 3rd tank put Cake back in 2nd tank after press 1 Tank & put filtrate in 2nd Tank

Think 3 washings of 1 tank will Exhaust it & so on the original solution started washing to stronger & stronger until finally it very strong, It then can be Evaporated down by a 2 or 3 stage Yaran Vacuum Evaporator till ready to Extract the Lithium -

With Ambliganite, Wooden Tanks are necessary & 2 pumps on

& carry on to full extraction
Magnesium Oxide &
get results,

Remarks before
leaving for Flia —

Try Clay & Al_2SO_4 -
heated but not so it
dont go to a soup
etc & test —
also H_2SO_4 alone &
afterwards Lime
also alum (Na) &
also Sulfate Aluminum &
also Bisulfate soda

Then on Lepidolite & also
Spod — but think
Lime for Spod is OK
& perhaps Lepidolite

(55)

Continued

1 Ton or 7/10 Ton of alum (soda) — or 7/10 of Sulphate of aluminum or 1 Ton of 60 Baume acid Can be used,

As Aluminum needs an acid salt — This goes many times as much for than Sprod of Lep with the alkali as Lime dissolves very slightly & requires time while Alum or Aluminum Sulfate or H_2SO_4 dissolves Easily —

I am not sure but think the Lime Extraction has alkali in form of Hydroxides —

Aluminum I think is a sulphate. —

for battery the K or Na need not be separated out

all made hydroxide &
allowed for,

If there is humble with
final solution may
have to evap down for
crystals of Li_2CO_3 & then
Causticize with Lime
as usual —

If the residue is full of
Alum or Na_2SO_4 probably
Carbonate method or
alcohol ~~etc~~ or
Cryolite take most
out, Change ~~Dec~~ & take
but please for factor
& buy ore & also purchase
area or lease of East
mine for reserve of $20000
such is necessary

but dont attempt to mine beat
lease & buy on a % of Li_2
3% Spod $5 - 3½ $6 4% $7
Lepidolite 6 7 8
Amblig - $15. for 8% & less
as % goes down Li_2O is
basic —

Amblygonite Sols may have
to be limed (10) Caustic lime
will take out alumina
& fluorine & phosphorus